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[10191/3045]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**
**BOARD OF PATENT APPEALS AND INTERFERENCES**

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|---|---|---|
| In re Application of: | | : |
| | | : Examiner: Sheldon J. Richter |
| | Michael Baeuerle | : |
| For: | METHOD FOR REGULATING SUPERCHARGING OF AN INTERNAL COMBUSTION ENGINE | : |
| Filed: | September 5, 2003 | : Art Unit: 3748 |
| Serial No.: | 10/656,404 | : |

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**Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**
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**Date:** 2/11/2005
**Signature:**
**AARON C. DEDITCH** (33,865)

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Alexandria, VA 22313-1450

## APPEAL BRIEF TRANSMITTAL

SIR:

Accompanying this Appeal Brief Transmittal is an Appeal Brief pursuant to 37 C.F.R. § 1.192(a) **in triplicate** for filing in the above-identified patent application.

Please charge the appropriate fees of **$500.00**, which includes the Appeal Brief fee under 37 C.F.R. § 1.17(c) (which is believed to be $500.00), to Deposit Account No. **11-0600**. The Commissioner is also authorized, as necessary and/or appropriate, to charge any additional and appropriate fees, including any Rule 136(a) extension fees, or credit any overpayment to Deposit Account No. **11-0600**. Two duplicate copies of this transmittal are enclosed for these purposes.

Respectfully submitted,

Dated: 2/11/2005

By Richard L. Mayer By ACD Reg. No. 33,865 Aaron C DEDITCH

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Attorney Docket No. 10191/3045
Appeal Brief

OIPE JC112
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**<u>APPEAL BRIEF PURSUANT TO 37 C.F.R. § 1.192(a)</u>**

SIR:

In the above-identified patent application ("the present application"), Appellants mailed a Notice Of Appeal on January 4, 2005 from the Final Office Action issued by the U.S. Patent and Trademark Office on October 6, 2004, so that a two-month appeal brief due date is March 4, 2005. In the Final Office Action, claims 1, 2 and 10 were finally rejected (and claims 3 to 9 and 11 to 16 were indicated as containing allowable subject matter and were therefore only objected to).

A Response After A Final Office Action was mailed on November 16, 2004, and an Advisory Action was mailed on December 13, 2004.In accordance with 37 C.F.R. § 1.192(a), this Appeal Brief is being submitted in triplicate in support of the appeal of the final rejections of claims 1, 2 and 10. It is respectfully submitted that the final rejections of these claims should be reversed for the reasons set forth below.

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## 1. REAL PARTY IN INTEREST

The real party in interest in the present appeal is Robert Bosch GmbH ("Robert Bosch") of Stuttgart in the Federal Republic of Germany. Robert Bosch is the assignee of the entire right, title and interest in the present application.

## 2. RELATED APPEALS AND INTERFERENCES

There are no interferences or other appeals related to the present application, which "will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal".

## 3. STATUS OF CLAIMS

1. Claims 1, 2 and 10 were finally rejected under 35 U.S.C. § 102(b) as anticipated by Unland et al., U.S. Patent No. 5,680,763.

A copy of the appealed claims (which excludes the "objected to" claims 3 to 9 and 11 to 16) is attached hereto in the Appendix.

## 4. STATUS OF AMENDMENTS

In response to the Final Office Action mailed on October 6, 2004, Appellants filed a Response After A Final Office Action, which was mailed on November 16, 2004.

## 5. SUMMARY OF THE INVENTION

The exemplary embodiments and/or methods of the presently claimed subject matter are described as follows in the context of the present application.

Figure 1 shows an internal combustion engine 10 having an intake pipe 12 and an exhaust duct 13. A throttle valve 14 and a sensor 15 for detecting aperture angle $\alpha$ of throttle valve 14 are situated in intake pipe 12. In addition, a pressure sensor 16 for detecting actual charge pressure pvdk is situated downstream from throttle valve 14. A rotational speed sensor 17 for detecting engine rotational speed nmot is attached to internal combustion engine 10. Internal combustion engine 10 is provided with a turbocharger, an exhaust gas turbine 18 being situated in exhaust duct 13 and a compressor 19 being situated in intake pipe 12. Compressor 19 is driven by a shaft 11 (indicated by a dashed line) of exhaust gas turbine 18.

Exhaust gas turbine 18 is bypassed in a conventional manner by a bypass line 20 in which a bypass valve 21 is situated. Bypass valve 21 is actuated in a conventional manner by a spring-loaded pressure box connected to an electropneumatic cycling valve. The spring-loaded pressure box having the electropneumatic cycling valve is represented by block 22 in Figure 1. (See specification, page 6, lines 1 to 20).

A controller 23 which receives throttle valve aperture angle α, measured actual charge pressure pvdk, and engine rotational speed nmot as input signals is described in greater detail below; it generates a manipulated variable ldtv for bypass valve 21. More precisely, manipulated variable ldtv controls the electropneumatic cycling valve as a pulse duration modulated signal, the electropneumatic cycling valve in turn generates the pressure for the spring-loaded pressure box, which in turn acts on the bypyass valve. The exhaust gas stream through turbine 18 may also be controlled by altering the turbine geometry.
One example of a controller 23 is described below with reference to Figures 2 through 6. The controller is implemented as a PID controller. However, any other type of controller may also be used. (See specification, page 6, line 22 to page 7, line 2).

As shown in the functional diagram in Figure 2, a setpoint charge pressure plsol is read from a characteristic map KFLDPS as a function of engine rotational speed nmot and throttle valve position α. In addition, actual charge pressure pvdk is measured by a pressure sensor upstream from the throttle valve. The difference between setpoint charge pressure plsol and actual charge pressure pvkd is determined in a node V1. This difference is designated as deviation lde. If condition B_ldr for actuation of the charge pressure regulation is present, a switch S1 is applied at the output of node V1 so that the above-mentioned difference between setpoint charge pressure plsol and actual charge pressure pvkd is present as deviation lde at the output of switch S1. If the charge pressure regulation is not active, i.e., condition B_ldr is not met, switch S1 has a position 0.0. Deviation lde is therefore zero in this case. (See specification, page 7, lines 4 to 19).

A threshold value decider SE1 applies a logical 1 to the S input of an RS flip-flop FF when deviation lde exceeds a threshold UMDYLDR. The R input of RS flip-flop FF is connected to the output of a comparator K1. This comparator K1 produces a logical 1 when deviation lde is less than or equal to 0.0. Under those conditions, a logical 1 is present at

output Q of RS flip-flop FF when deviation lde exceeds threshold UMDYLDR, that is, a transition from stationary to dynamic operation occurs. If a logical 1 is present at the R input of RS flip-flop FF, that is, deviation lde is less than zero (the actual charge pressure is greater than the setpoint charge pressure), flip-flop FF is reset and a logical 0 is present at its output Q. Output signal B_lddy at the Q output of flip-flop FF indicates whether dynamic operation (logical 1) or stationary operation (logical 0) is present. (See specification, page 7, lines 21 to 35).

A proportional action controller parameter ldrkp, a differential action controller parameter ldrkd, and an integral action controller parameter ldrki are determined in function block R1 as a function of operating condition B_lddy and engine rotational speed nmot. The determination of action controller parameters ldrkp, ldrkd, and ldrki in function block R1 is described in greater detail below, with reference to Figure 3. The product of proportional action controller parameter ldrkp and deviation lde in multiplier V2 creates a proportional component ldptv for manipulated variable ldtv of the turbocharger. A differential component ldrdtv of manipulated variable ldtv results in multiplier V3 from the product of differential action controller parameter ldrkd and the difference between instantaneous deviation lde and deviation lde(i–1) determined in the previous cycle (approximately 50 ms previously). The difference between instantaneous deviation lde and previously determined deviation lde(i–1) is calculated in node V4. A delay element VZ1 supplies deviation lde(i–1) which has been delayed by one cycle. Integral component lditv of manipulated variable ldtv is formed by an integrator INT which calculates the product of integral action controller parameter ldrki and delayed deviation lde(i–1), and superimposes this product on integral component lditv(i–1) determined in the previous cycle. Finally, proportional component ldptv, differential component ldrdtv, and integral component lditv are added in node V5, resulting in manipulated variable ldtv for a bypass valve of the turbocharger. (See specification, page 8, lines 1 to 34).

Integral component lditv has an upper bound to avoid over-swing in the action controller of the charge pressure. Limit value ldimx for integral component lditv is determined in a switching unit R2, which is further described below with reference to Figure 4, as a function of deviation lde, integral component lditv, setpoint charge pressure plsol,

engine rotational speed nmot, and ratio vrlsol of the setpoint filling and the maximum filling of the cylinder. (See specification, page 9, lines 1 to 8).

Function block R1 illustrated in Figure 3 contains three characteristic maps LDRQ1DY, LDRQ1ST, and LDRQ2DY which depend on engine rotational speed nmot. If condition B-lddy for dynamic operation is present, integral action controller parameter ldrki from characteristic curve LDRQ1DY for dynamic operation is switched to the output by switch S2. Differential action controller parameter ldrkd is switched to the output by switch S3 from characteristic curve LDRQ2DY. Proportional action controller parameter ldrkp is produced in node V6 by subtracting a fixed value LDRQOD, switched by a switch S4 to node V6, from differential action controller parameter ldrkd. If condition B_lddy for dynamic operation is not present, and the engine is instead in stationary operation, integral action controller parameter ldrki is obtained from characteristic curve LDRQ1ST; accordingly, switch S2 is now connected to characteristic curve LDRQ1ST. Differential action controller parameter ldrkd is set at 0.0 via switch SR3, and proportional action controller parameter ldrkp is set at a fixed value LDRQOS by switch S4. Fixed values LDRQOD, LDRQOS, and characteristic curves LDRQ1DY, LDRQ1ST, and LDRQ2DY are determined by bench tests in such a way that the charge regulation is optimized in the dynamic and stationary operating states. (See specification, page 9, lines 10 to 32).

Figure 4 illustrates function block R2, which derives limit value ldimx for integral component lditv from engine rotational speed nmot, setpoint charge pressure plsol, a corrected base charge pressure plgruk, deviation lde, ratio vrlsol of the setpoint filling to the maximum filling of the cylinder, and integral component lditv of the manipulated variable. A relative setpoint charge pressure plsolr is composed of a base value, absolute setpoint charge pressure plsol, and a correction value plgruk, which is the corrected base charge pressure negatively superimposed on the absolute setpoint charge pressure in node V20. A pilot control value ldimxr of limit value ldimx is derived from a characteristic curve KFLDIMX as a function of rotational speed nmot and relative setpoint charge pressure plsolr. In addition, a fixed predetermined value LDDIMX may be added to pilot control value ldimxr in node V9. This value LDDIMX corresponds to a small fraction (approximately 0–5%) of limit value ldimx, which ensures that the value of LDDIMX does not fall below this

small value under any circumstances. If the instantaneous integral component is greater than the limit value less value LDDIMX, which represents the safety margin, it is possible to spontaneously regulate the charge pressure without raising the limit value, provided that the charge pressure deviation to be adjusted does not cause any values greater than LDDIMX. Using pilot control value ldimxr, it is possible to achieve a semi-pilot control in the form of a variable minimum and maximum limit of the integral component. The minimum and maximum limits are formed by additive correction using a fixed pulse duty ratio which has a negative deviation from pilot control value ldimxr for the minimum limit due to limit value LDDIMNN, and a positive deviation for the maximum limit due to limit value LDDIMXN, so that an operating range for the integral component is established about this pilot control value ldimxr within the minimum-maximum limit. In the example described with reference to Figure 4, the maximum limit may be achieved by value LDDIMX, for example, resulting in limit value ldimx as the upper limit value for the integral component. Value LDDIMX then corresponds to limit value LDDIMXN for the maximum limit. Similarly, it is possible to form a lower limit value ldimn for the integral component by subtracting limit value LDDIMNN from pilot control value ldimxr, although this is not illustrated in the figures for the sake of clarity. (See specification, page 9, line 34 to page 11, line 9).

A limiting stage BG1 limits limit value ldimx to a specifiable value TVLDMX, which, for example, corresponds to 95% of the pulse duty of the manipulated variable for the charge pressure regulation. An instantaneous correction value dplguldia for base charge pressure plgruk appears at the output of a totalizer SU. Under certain conditions, the correction value present at input 1 of this totalizer SU is either incrementally decreased or incrementally increased. An incremental decrease in the correction value to take place in totalizer SU occurs under the following conditions: The charge action controller is active; in other words, condition B_ldr is set, and instantaneous limit value ldimx is not at either the upper or lower end of limiting stage BG1. Both information items are present at the inputs of an AND gate AN1 which sends a logical 1 to a further AND gate when the two referenced conditions are met. An additional condition is that the absolute value of deviation lde be less than a threshold LDEIA. To this end, deviation lde is fed to an absolute value generator BB and then to a threshold value decider SE2 which at its output delivers a logical 1 to AND gate

AN2 when the absolute value of deviation lde is below threshold LDEIA. This threshold LDEIA is approximately zero. (See specification, page 11, lines 11 to 35).

In addition, a threshold value decider SE3 checks whether ratio vrlsol of the setpoint filling to the maximum filling of the cylinder is above a threshold LDRVL. If this is the case, the engine operates at full load, and threshold value decider SE3 sends a logical 1 to an input of AND gate AN2. The last condition to be met is that integral component lditv be less than limit value ldimx. Accordingly, a comparator K2 compares integral component lditv of the manipulated variable to limit value ldimx upstream from node V9. A logical 1 appears at the output of comparator K2 when integral component lditv is greater than pilot control value ldimxr. The output signal of comparator K2 arrives at an input of AND gate AN2 via an inverter NOT. Thus, a logical 1 is present at this input of AND gate AN2 when integral component lditv is less than limit value ldimx. (See specification, page 12, lines 3 to 18).

When all of the above-mentioned conditions have been met, a logical 1 is present at the output of AND gate AN2. This condition B_ldimxn for a negative incremental compensation of the correction value in totalizer SU is delayed in a delay element VZ2 by a fixed debouncing time TLDIAN at a switch S5, and is supplied to an OR gate OR1. If condition B_ldimxn for a negative incremental compensation of the correction value is specified, switch S5 connects input 4 of totalizer SU to a read-only storage SP1 in which increment LDDIAN for the negative compensation of the correction value is stored. If condition B_ldimxn is not met (corresponding to a logical 0 at the output of AND gate AN2), switch S5 switches to a memory SP2 in which increment LDDIAP for a positive compensation of the correction value is stored. (See specification, page 12, lines 20 to 33).

The following three conditions are met for an incremental positive compensation of the correction value:

– As previously described for the negative incremental compensation, a logical 1 is present at the output of AND gate AN1.

– In addition, deviation lde is greater than 0, a very small deviation from 0 being sufficient. A threshold value decider SE4 produces a logical 1 at its output when this condition is met.

– Finally, instantaneous integral component ldity of the manipulated variable is greater than instantaneous limit value ldimx. As previously described, this condition is checked by comparator K2. (See specification, page 13, lines 1 to 15).

The output of this comparator K2 as well as the output of threshold value decider SE4 and the output of AND gate AN1 are present at an AND gate AN3. A logical 1 is present at the output of the latter when the three previously mentioned conditions are met.
The output signal of AND gate AN3, which is condition B_ldimxp for the incremental positive compensation of the correction value, is supplied via a delay element VZ3, whose delay time is equal to a debouncing time obtained from a characteristic curve TLDIAPN which is a function of engine rotational speed nmot. Condition B_ldimxn for the negative incremental compensation of the correction value and condition B_ldimxp for the positive incremental compensation are both present at the inputs of OR gate OR1. The output signal of this OR gate which is present at input 2 of totalizer SU signals to totalizer SU whether a positive or negative incremental compensation for the correction value present at input 1 of this OR gate should be performed. (See specification, page 13, lines 17 to 35).

Correction value dplguldia present at the output of totalizer SU is also fed to an input 5 of a function block AS in which the correction value is adapted. This adaptation is not carried out unless the engine is operating at full load and the condition for a positive or negative incremental compensation of the correction value is met. Information on full load operation can be retrieved at the output of above-mentioned threshold value decider SE3. Information on whether a positive or negative incremental compensation takes place may be obtained from the output signal of OR gate OR1. The output signal from threshold value decider SE3 as well as the output signal from OR gate OR1 are fed to the inputs of an AND gate AN4. When the two referenced conditions are met, output signal B_ldimxa of AND gate AN4 is a logical 1. Condition B_ldimxa for an adaptation of the correction value is present at input 6 of function block AS. Whenever condition B_ldimxa = 1 applies, the instantaneous value from totalizer SU is accepted in a corresponding memory cell of function block AS in which numerous values simulating an adaptation characteristic curve are stored. (See specification, page 14, lines 1 to 20).

Interpolation points stldea for the adaptation of the correction value in function block AS are delivered from a function block R3. Function block R3 also supplies information B_stldw on change of interpolation points. Either adapted correction value ldimxa from the output of function block AS or an adapted correction value ldimxaa is fed to an input 1 of totalizer SU for the formation of correction value dplguldia, in which jumps occurring in the negative direction have been limited to a minimum value. The selection between adapted correction value ldmixa and limited adapted correction value ldimxaa is made using a switch S6. Switch S6 switches to non-limited adapted correction value ldimxa when the charge pressure action controller is first activated, that is, immediately after appearance of a rising edge of condition B_ldr for the charge pressure action controller. The rising edge of signal B_ldr detects a flip-flop AF. Otherwise, switch S6 is in the other position and feeds limited adapted correction value ldimxaa to input 1 of totalizer SU. (See specification, page 14, line 22 to page 15, line 6).

One input 3 of totalizer SU receives information from the output of an OR gate OR2 as to whether a rising edge of charge pressure activation signal B_ldr is present or whether signal B_stldw indicates a change in interpolation points in function block R3. Limited adapted correction value ldimxaa is formed as follows. Instantaneous correction value dplguldia sent from totalizer SU in a node V10 is subtracted from adapted correction value ldimxa present at the output of function block AS. Differential signal ldimxad is fed to limiting stage BG2. Limiting stage BG2 limits negative jumps of differential signal ldimxad to a predetermined limit value LDMXNN. Limited differential signal ldimxab at the output of limiting stage BG2 is added to instantaneous correction value dplguldia in node V11, ultimately producing limited adapted correction value ldimxaa. (See specification, page 15, lines 8 to 24).

Figure 7 illustrates a course "a" of a regulating characteristic curve. The characteristic curve shows the dependence of the controlled variable (of charge pressure pvdk) on manipulated variable ldtv. Characteristic curve a normally has a nonlinear course which is caused primarily by the actuator, which has an electropneumatic cycling valve, a spring-loaded pressure box which actuates it, and the bypass valve actuated by the pressure box. Due to its nonlinearity, characteristic curve a has different slopes at operating points A1 and A2

which are situated farther apart, as indicated in Figure 7. If, for example, the controller were set at operating point A1, a change of Δldtv in the manipulated variable would result in a change Δpvdk1 of 40 millibars in the charge pressure. If the operating point were now shifted to A2, the same change Δldtv in the manipulated variable would result in a significantly greater change Δpvdk2 of approximately 220 millibars in the charge pressure. Thus, a shift in the operating point from A1 to A2 would cause an over-swing of approximately 180 millibars in the charge pressure action controller. Such an undesired effect may be avoided by transforming nonlinear characteristic curve a into a linear characteristic curve "b". For a linear characteristic curve b, a change of Δldtv in manipulated variable ldtv would result in the same change in the charge pressure. (See specification, page 15, line 26 to page 16, line 14).

The regulating characteristic curve may be linearized by the following measures: As shown in Figure 2, manipulated variable ldtv is supplied to a characteristic map KFLD at the output of node V5. In this characteristic map KFLD, for each possible operating point the manipulated variable determined by the controller is transformed into a value such that a linear relationship results between the transformed values of manipulated variable ldtv and charge pressure pvdk. The transformation values derived from known nonlinear characteristic curve "a" during calibration of the controller are stored in characteristic map KFLD so that during normal operation of the controller it is possible to associate each calculated value of the manipulated variable with a corresponding transformed value. (See specification, page 16, lines 16 to 30).

Instead of characteristic map KFLD for the transformation of manipulated variable ldtv, proportional component ldptv routed to manipulated variable ldtv may also be transformed in a characteristic map KFPT, and/or differential component ldrdtv may be transformed in a characteristic map KFDT, and/or integral component lditv may be transformed in a characteristic map KFIT. All characteristic maps KFPT, KFDT, and KFIT may also be combined. Also, in addition to the above-mentioned characteristic maps, characteristic map KFLD may be present for resulting manipulated variable ldtv. Another alternative is to transform maximum value ldimx for integral component lditv in a characteristic map KFMX. Listed characteristic maps KFLD, KFPT, KFDT, KFIT, and

KFMX may be provided alone or in combination with other characteristic maps; in each case they are applied so that at least approximately linear relationship results between manipulated variable ldtv and charge pressure pvdk. (See specification, page 16, line 32 to page 17, line 13).

Interpolation points stldea for adapting the correction value in function block AS are supplied by a function block R3, which is further described below with reference to Figure 6. Function block R3 also supplies information B_stldw on changes in interpolation points. Figure 6 shows how interpolation points sdldea, which are supplied to function block AS for adaptation at input 7, are formed. According to one implementation, four circuits H1, H2, H3, and H4 generating hysteresis are provided. A hysteresis constant LDHIA present at all circuits H1 through H4 specifies the hysteresis width. The hystereses of four circuits H1 through H4 are distributed with respect to engine rotational speed nmot in such a way that each hysteresis covers one of four rotational speed ranges. This rotational speed-dependent position of the individual hystereses is predetermined for individual hysteresis circuits H1 through H4 by constants STLDIA1, STLDIA2, STLDIA3, and STLDIA4. Depending on which of the four rotational speed ranges instantaneous rotational speed nmot is situated in, a signal is sent from the output of hysteresis circuit H1 or H2 or H3 or H4. Each of the output signals controls a circuit S7, S8, S9, or S10. Interpolation points 1.0, 2.0, 3.0, 4.0, and 5.0 are present at the inputs of switches S7, S8, S9, and S10. Depending on the circuit position, that is, as a function of instantaneous rotational speed range nmot, one of the five interpolation points is connected as output signal stldia and reaches input 7 of adaptation circuit AS. Depending on the size of interpolation point stldea, the slope of the adaptation characteristic curve increases or decreases; adapted correction value ldimxa thus becomes greater or smaller as a result of the adaptation. (See specification, page 17, line 15 to page 18, line 10).

In hysteresis circuits H1...H4, there is a right-hand switching point STLDIA1...4 and a left-hand switching point STLDIA1...4-LDHIA. As the rotational speed increases, that is, when nmot ≥ STLDIA1...4, the output of affected hysteresis circuit H1...H4 is switched to "1." The output is then reset to "0" when nmot ≤ STLDIA1...4-LDHIA. Information on the change in interpolation points B_stdlw is obtained using a comparator K3. This comparator compares instantaneous interpolation point value stldia to interpolation point value stldia(i–1)

determined in the previous cycle. A delay element VZ4 provides previous interpolation point stldia(i–1) for comparator K3. If the two interpolation point values stldia and stldia(i–1) present at the inputs of comparator K3 differ from one another, comparator K3 supplies information on a change in interpolation point B_stdlw at its output. (See specification, page 18, lines 11 to 28).

Correction value dplguldia determined in switching unit R2 is fed to a further switching unit R10, as illustrated in Figure 2. Switching unit R10 determines corrected base charge pressure plgruk from correction value dplguldia, engine rotational speed nmot, an intake air temperature tsel, a calibration elevation FHBASAPP above sea level, and an instantaneous elevation fho of internal combustion engine 10 above sea level. This base charge pressure is in turn fed to switching unit R2, where it is subtracted from setpoint charge pressure plsol in node V20, as described, to produce relative setpoint charge pressure plsolr. The design and operating mode of switching unit R10 are described with reference to the function diagram according to Figure 5. Base charge pressure plgru is determined at calibration elevation FHBASAPP as a function of engine rotational speed nmot according to a characteristic curve PLGUB. Characteristic curve PLGUB was previously adapted to an engine bench test, for example, at calibration elevation FHBASAPP. Calibration elevation FHBASAPP may be close to sea level, for example. Base charge pressure plgru denotes the minimum obtainable charge pressure for a fully open throttle valve having a pulse duty factor of 0% as the manipulated variable, which indicates the lower control limit of the regulating system. (See specification, page 18, line 30 to page 19, line 19).

Using an additional characteristic curve DPLGU, a correction base charge pressure kplgur based on calibration elevation FHBASAPP is calculated from engine rotational speed nmot, and the correction base charge pressure when multiplied by instantaneous elevation difference HD between instantaneous elevation fho and calibration elevation FHBASAPP describes the change in base charge pressure plgru with elevation. Characteristic curve DPLGU may provide correction base charge pressure kplgru up to, for example, an elevation difference HD of approximately 2500 meters. Instantaneous elevation difference HD is determined in a node V40 by subtracting instantaneous elevation fho from calibration elevation FHBASAPP. Instantaneous elevation difference HD is then multiplied by

correction base charge pressure kplgru in a node V30. This results in a base charge pressure plgruhk corrected for elevation. Correction base charge pressure kplgru is negative, so that for instantaneous elevations fho greater than calibration elevation FHBASAPP a positive base charge pressure plgruhk is obtained, which is corrected for elevation. For instantaneous elevations fho less than calibration elevation FHBASAPP, negative base charge pressures plgruhk corrected for elevation are correspondingly obtained. Base charge pressure plgruhk corrected for elevation and correction value dplguldia are then subtracted from base charge pressure plgru in a node V25. Correction value dplguldia thus represents a correction base charge pressure necessary for adapting limit value ldimx. In addition, the result of subtraction in node V25 may optionally be multiplied by a correction factor KF in a node V35 to take temperature effects into account. Correction factor KF is determined from a characteristic map K10 as a function of engine rotational speed nmot and intake air temperature tsel. Corrected base charge pressure plgruk is then present at the output of node V35. (<u>See</u> specification, page 19, line 21 to page 20, line 19).

Limit value ldimx now is no longer adapted by adding directly to pilot control value ldimxr as a pulse duty factor offset, but rather by subtracting in the form of offset or correction value dplguldia from base charge pressure plgru. As an example, slightly positive correction value dplguldia reduces calculated base charge pressure plgru, so that an increasing relative setpoint charge pressure plsolr is calculated. This increasing relative setpoint charge pressure plsolr causes pilot control value ldimxr to increase in characteristic map KFLDIMX. A subsequent direct correction of pilot control value ldimxr using an adaptation value is now omitted, so that for transient adaptation, limit value ldimx then still corresponds to manipulated variables or pulse duty factor requirement lditv of the integral component of the controller. (<u>See</u> specification, page 20, lines 21 to 35).

Figure 8 illustrates the curve of integral component lditv as a function of relative setpoint charge pressure plsolr. According to the method of the present invention, ideal curve VERL1 is obtained, taking into account the subsequent linearization of the regulating characteristic curve described above according to Figure 7, without offsetting the pulse duty factor, which would result in characteristic curve VERL2 being shifted upwards by X.

For relative setpoint charge pressures plsolr less than or equal to zero, that is, for absolute charge pressures less than or equal to corrected base charge pressure plgruk, the pulse duty factor obtained is ideally 0% for integral component lditv. This is also true, for example, for an absolute setpoint charge pressure plsol corresponding to an ambient pressure pu which is less than corrected base charge pressure plgruk. (See specification, page 21, lines 3 to 19).

The setpoint value of an operating parameter is represented by the setpoint charge pressure, the actual value of the operating parameter is represented by the actual charge pressure, the first operating parameter is also represented by the setpoint charge pressure, the second operating parameter is represented by the engine rotational speed, and the third operating parameter is represented by the throttle valve setting, and the variable characterizing the instantaneous ambient conditions is represented by the intake air temperature and/or the instantaneous elevation of the internal combustion engine. (See specification, page 21, lines 21 to 31).

In summary, the present invention is directed to a method for regulating a supercharge of an internal combustion engine, including: generating a manipulated variable from a deviation between a setpoint value of an operating parameter of the internal combustion engine and an actual value of the operating parameter, the manipulated variable having at least one integral component supplied by an integral action controller; specifying at least one limit value for the integral component, the at least one limit value being determined from a plurality of operating parameters of the internal combustion engine; and adapting the at least one limit value by adaptively determining a first operating parameter of the plurality of operating parameters as a function of a second operating parameter. (See claim 1).

## 6. ISSUES

1. Under 35 U.S.C. § 102(b), are claims 1, 2 and 10 anticipated by Unland et al., U.S. Patent No. 5,680,763?

## 7. GROUPING OF CLAIMS

Group 1: Claims 1, 2 and 10 stand or fall together.

## 8. ARGUMENT

Issue 1 – Anticipation Rejections of Claims 1, 2 and 10

Group 1 – Claims 1, 2 and 10

With respect to paragraph one (1) of the Final Office Action, claims 1, 2 and 10 were rejected under 35 U.S.C. § 102(b) as anticipated by U.S. Patent No. 5,680,763 to Unland et al. ("Unland").

As regards the anticipation rejections of the claims, to reject a claim under 35 U.S.C. § 102, the Office must demonstrate that each and every claim feature is identically described or contained in a single prior art reference. (See *Scripps Clinic & Research Foundation v. Genentech, Inc.*, 18 U.S.P.Q.2d 1001, 1010 (Fed. Cir. 1991)). As explained herein, it is respectfully submitted that the prior Office Action does not meet this standard, for example, as to all of the features of the claims. Still further, not only must each of the claim features be identically described, an anticipatory reference must also enable a person having ordinary skill in the art to practice the claimed subject matter. (See *Akzo, N.V. v. U.S.I.T.C.*, 1 U.S.P.Q.2d 1241, 1245 (Fed. Cir. 1986)).

As further regards the anticipation rejections, to the extent that the Office Action may be relying on the inherency doctrine, it is respectfully submitted that to rely on inherency, the Examiner must provide a "basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristics *necessarily* flows from the teachings of the applied art." (See M.P.E.P. § 2112; emphasis in original; and see *Ex parte Levy*, 17 U.S.P.Q.2d 1461, 1464 (Bd. Pat. App. & Int'f. 1990)). Thus, the M.P.E.P. and the case law make clear that simply because a certain result or characteristic may occur in the prior art does not establish the inherency of that result or characteristic.

The "Unland" reference refers to a system which includes a controller, in which the integration of the control deviation is limited to a predefinable limit value to avoid severe overshoots. As characterized, various limit values are predefinable for stationary and for dynamic operating states. Also, the dynamic limit value may be provided with corrections that are functions of operating parameters (operating characteristic quantities) and with an adaptive correction, and additionally increased by a safety factor. In this context, correction and adaptation of the limit value for the integral-action component are purportedly indicated

in Figure 2 and the related text, at the level of the on/off ratio as a control output variable. As characterized, the correction and the adaptation of the limit value for the integral-action component of the controller occurs as a function of operating parameters of the internal combustion engine (TL, H, n in Figure 2), and from these operating parameters, the correction value or adaptation value for the limit value of the controller is determined with a characteristics map (210 or 218).

With regard to the integral component as provided for in the context of claim 1, the Final Office Action refers to characteristics map 126 in Figure 1. The characteristics map 126 in Figure 1 of "Unland", however, is used to determine the setpoint value PSoll of the charging pressure from the engine rotational speed and the angle of aperture of the throttle valve. *In the Advisory Action, the Examiner failed to acknowledge the fact that this setpoint value for the charging pressure, however, has nothing to do with the limiting value for the integral component of the integral controller.* Moreover, the setpoint value for determining the system deviation already differs in terms of dimension from the limiting value for limiting the integral component of the integral controller in the subject matter of the "Unland" reference.

Thus, the output of characteristics map 126 is a charging pressure, while the limiting value for the integral component is a pulse duty factor. The limiting of the integral controller 134 in the subject matter of the "Unland" reference occurs with the aid of limiter stage 140, which either accesses the output of the read only memory 144 as a static limiting value IMaxS or the output of block 146 as a dynamic limiting value IMaxD. In this connection, the dynamic limiting IMaxD is corrected as a function of operating parameters of the internal combustion engine. The internal wiring of block 146 is shown in Figure 2.

*For this reason, contrary to the assertions of the Final Office Action, to assess claim 1 with respect to the applied reference, one must consider Figure 2 and the associated text of the "Unland" reference, but not the characteristics map 126 according to Figure 1 of the "Unland" reference.*

Claim 1 is to a method for regulating a supercharge of an internal combustion engine, including: generating a manipulated variable from a deviation between a setpoint value of an operating parameter of the internal combustion engine and an actual value of the operating

parameter, the manipulated variable having at least one integral component supplied by an integral action controller; specifying at least one limit value for the integral component, the at least one limit value being determined from a plurality of operating parameters of the internal combustion engine; and *adapting the at least one limit value by adaptively determining a first operating parameter of the plurality of operating parameters as a function of a second operating parameter.*

In particular, with the subject matter of claim 1, *the limit value is adapted by adaptively determining a first operating parameter* (which is used for ascertaining or determining the limit value) *as a function of a second operating parameter*. This means that for the adaptation of the limit value one of the operating parameters would be adapted as a function of an additional operating parameter and then accordingly supplied to a characteristics map to ascertain or determine the correction value or the adaptation value for the limit value of the integral-action component of the controller.

As explained above, as to the "Unland" reference, however, an adaptation of the input values (TL, H, n of the characteristics maps (210, 218), as to Figure 2 of the "Unland" reference) is simply not identically described (nor suggested) by that reference.

Also, the adaptation of the limit value by adapting a first operating parameter (of the ones used for the ascertaining of the limit value) as a function of a second operating parameter has the advantage that the adaptation of the limit value is shifted from the level of the manipulated variable (such as the on/off ratio, for example) to the level of the first operating parameter that is used for ascertaining the limit value. This means that the separate adaptation offset for the limit value of the integral-action component (as in "Unland" by the logic element (214) in Figure 2) may be omitted.

For the foregoing reasons, the "Unland" reference does not identically describe (or even suggest) all of the features of claim 1 (including the "adaptively determining" feature as provided for in the context of claim 1 as explained above) so that it does not anticipate claim 1.

It is therefore respectfully submitted that claim 1 is not identically disclosed (or even suggested by the "Unland" reference, and is therefore allowable.

Claims 2 and 10 depend from claim 1, and are therefore allowable for the same reasons as claim 1.

Accordingly, it is respectfully submitted that claims 1, 2 and 10 are allowable for the above reasons.

## CONCLUSION

In view of the above, it is respectfully requested that the rejections of claims 1, 2 and 10 be reversed, and that these claims be allowed as presented.

Respectfully submitted,

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## APPENDIX

1. (Original) A method for regulating a supercharge of an internal combustion engine, comprising:

generating a manipulated variable from a deviation between a setpoint value of an operating parameter of the internal combustion engine and an actual value of the operating parameter, the manipulated variable having at least one integral component supplied by an integral action controller;

specifying at least one limit value for the integral component, the at least one limit value being determined from a plurality of operating parameters of the internal combustion engine; and

adapting the at least one limit value by adaptively determining a first operating parameter of the plurality of operating parameters as a function of a second operating parameter.

2. (Original) The method of claim 1, wherein the first operating parameter is determined from a base value which depends on at least a third operating parameter of the internal combustion engine and a correction value superimposed thereon, the correction value being adaptively determined as a function of the second operating parameter.

10. (Original) The method of claim 2, wherein the correction value is derived from characteristic maps as a function of the second operating parameter and a variable which characterizes instantaneous conditions of the internal combustion engine.